

Robots: Inanimate or Living

To evaluate the receptivity of Xenobots by Indian Respondents

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ABSTRACT

As industrialization continues, the world is introduced to many challenges such as Global Warming and Pollution. Even with adverse effects on the environment, synthetic materials continue to be commonly used. To tackle this, scientists from the University of Vermont combined the fields of AI and bio-technology to develop a robot capable of performing specific functions e.g., locomoting and manipulating objects, using cells. Other than reducing the use of synthetic materials, this robot can directly help in collecting microplastics from the ocean, while being biodegradable. With time, as manufacturing gets automated, the capability of these robots will be bewildered. Though it's not an immediate concern, the idea of a living robot can be seen to come with many ethical concerns. To understand the reservations it can create, this research paper intends to evaluate the receptivity of Xenobots by high-school students and teachers. A total of 30 respondents from various urban and suburban locations of the country were surveyed on their knowledge and interest of Xenobots before and after watching an informational video, and their thoughts on its ethical concerns and effectiveness were collected from open-ended questions. Qualitative and Quantitative tools such as t-tests, mean, SD tests and thematic analysis were used to study the accumulated data. The video positively impacted their rating of knowledge, however interest remained equally high. Further thematic analysis revealed that respondents were doubtful about its usefulness as well as its drawbacks which notifies aspiring companies and governments that it might be too soon for such technology.

INTRODUCTION

Xenobots are robots made from stem cells extracted from frogs. They can be considered living robots because they are made from cells and have properties such as:

- Locomotion: Due to the contraction of cardiac cells
- Object Manipulation and Transport: Possible with different body shapes
- Sustainable: Cells are biodegradable, and they can self-heal

OBJECTIVE

Some unanswered questions include:

- Are Xenobot organisms or robots?**
- What are some ethical concerns they raise?**

E.g, Bio-tech in weaponry; or if they are allowed to procreate - they could disrupt the cycle of life

METHODS AND MATERIALS

An online survey was conducted, which required some demographic information, answers to open-ended and rating-based questions, and a short informative video.

To evaluate the receptivity, factors tested were:

- Knowledge and Interest
Before and After a short informative video (Quantitative data)
- Ethical concerns and Advantages
Open ended questions, to get an understanding of the respondents' views on these topics. (Qualitative)

Data Analysis:

Qualitative - Thematic analysis was conducted on the responses to open-ended questions

Quantitative: Paired t-tests were conducted to analyse the difference in levels of knowledge and interest, before and after the short video.

Demographic data was collected but not analysed.

RESULTS

A majority of the respondents were students of Grades 9-12. A little more than half the respondents were interested in STEM, while the rest were divided between Commerce, Humanities and Undecided.

Quantitative: Mean and Standard Deviation values of the factors: Knowledge and Interest, before and after watching the informative video. (Table 1)

To understand whether there was a significant difference in these values, a t-test was conducted. (Table 2)

Since p values were below 0.05, the results reported significantly higher values of knowledge after watching the video. This wasn't the case with interest. ($p > 0.05$)

Qualitative: The respondents' views on Xenobots' ethical concerns and applications were thematically analysed.

Themes like Misuse of Technology, and Lack of Ownership were recurring.

Table 1: Mean and Standard Deviation values for all quantitative responses

Factor	Mean	Standard Deviation
Interest - Before	3.73	0.99
Interest - After	3.8	1.21
Knowledge - Before	1.55	0.98
Knowledge - After	3.34	0.92

Table 2: Summary of T-test Analysis on variables Interest and Knowledge, before and after a short informative video (N=30).

Source	Before		After		t	p
	M	SD	M	SD		
Knowledge	1.55	0.98	3.34	0.92	-11.21	0.00
Interest	3.73	0.99	3.8	1.21	-0.30	0.38

DISCUSSION

As the test revealed, the level of knowledge showed a significant increase, while the interest level remained approximately equal. This can be understood as the effect of: Initial lack of awareness (low ratings of knowledge); Effective Informative Video (a significant increase in ratings); Similar level of interest (high initial value).

From the thematic analysis, various themes hinted towards skepticism about such a technology.

The doubts regarding its misuse, caused the respondents to question its effectiveness and wonder who would be responsible for its misdeeds.

To get a comprehensive view, their views on its applications were also recorded:

Respondents viewed its many uses as crucial for 'improving human life and health', however its uncertainty again raised some doubt

CONCLUSIONS

This skepticism suggests that work needs to be done in clearing such ethical and technical concerns, before such potent robots are introduced.

This research can be useful for: Healthcare Sector (to understand the views of the public on such technology); Spreading awareness; Future generations (to understand some of the reservations the current generations had)

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